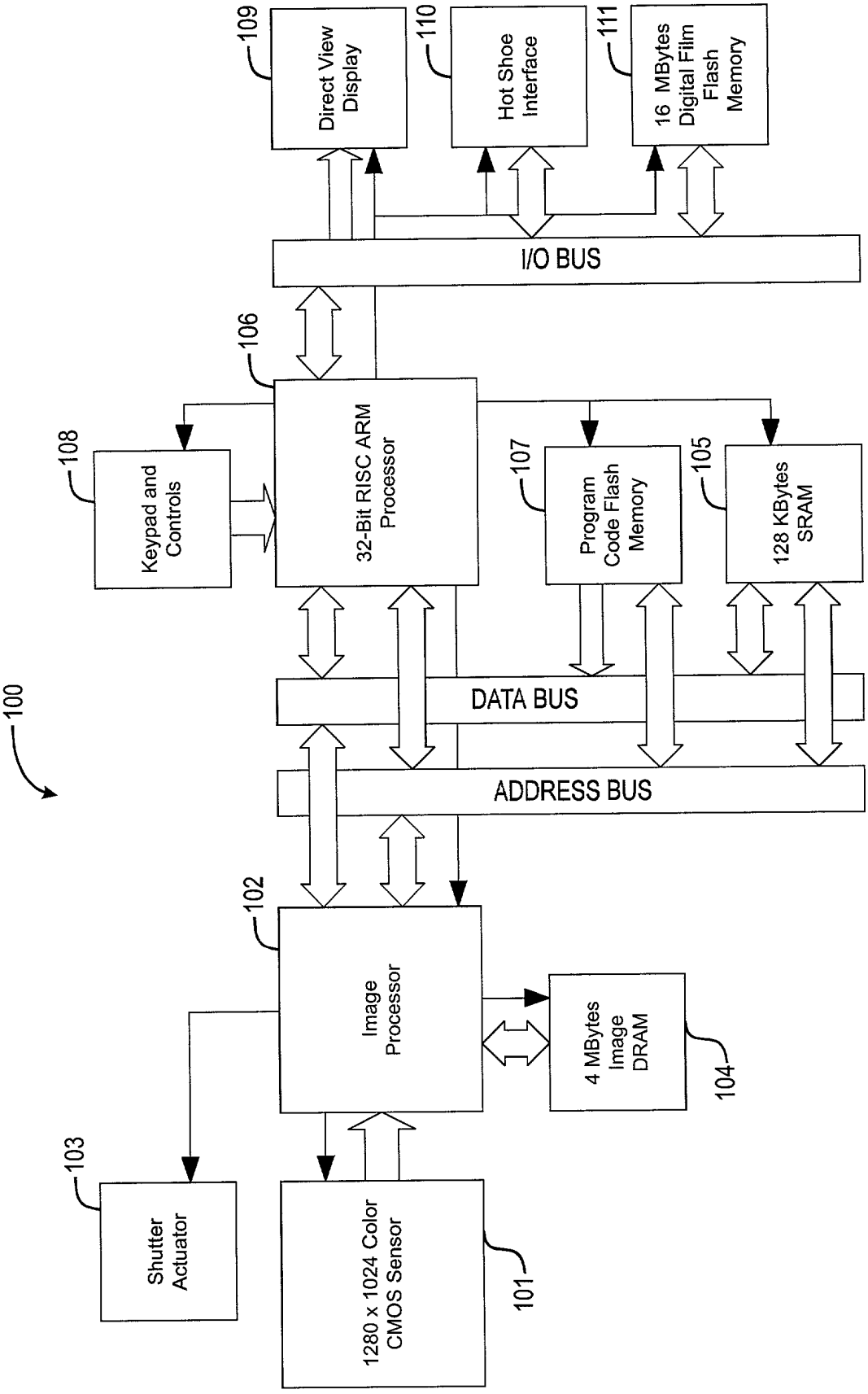

100
101
Shutter Actuator
103
1280 x 1024 Color CMOS Sensor
Image Processor
102
4 MBytes Image DRAM
104
Keypad and Controls
108
32-Bit RISC ARM Processor
106
Program Code Flash Memory
107
128 KBytes SRAM
105
Direct View Display
109
Hot Shoe Interface
110
16 MBytes Digital Film Flash Memory
111
I/O BUS
DATA BUS
ADDRESS BUS

FIG. 1A

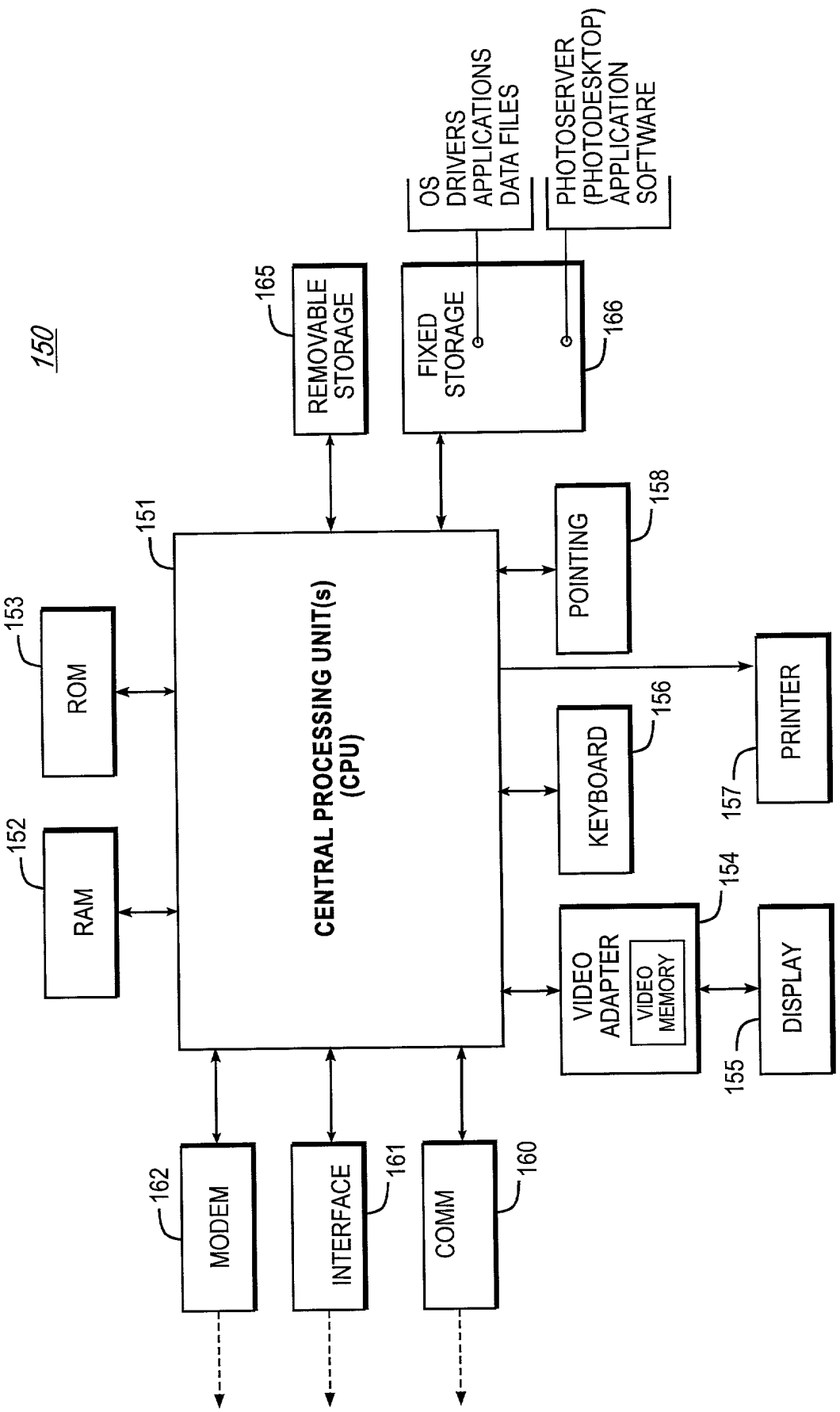

150
CENTRAL PROCESSING UNIT(s) (CPU)
151
ROM
153
RAM
152
REMOVABLE STORAGE
165
FIXED STORAGE
166
OS
DRIVERS
APPLICATIONS
DATA FILES
PHOTOSERVER (PHOTODESKTOP) APPLICATION SOFTWARE
POINTING
158
KEYBOARD
156
PRINTER
157
VIDEO ADAPTER
VIDEO MEMORY
154
DISPLAY
155
MODEM
162
INTERFACE
161
COMM
160

FIG. 1B

200

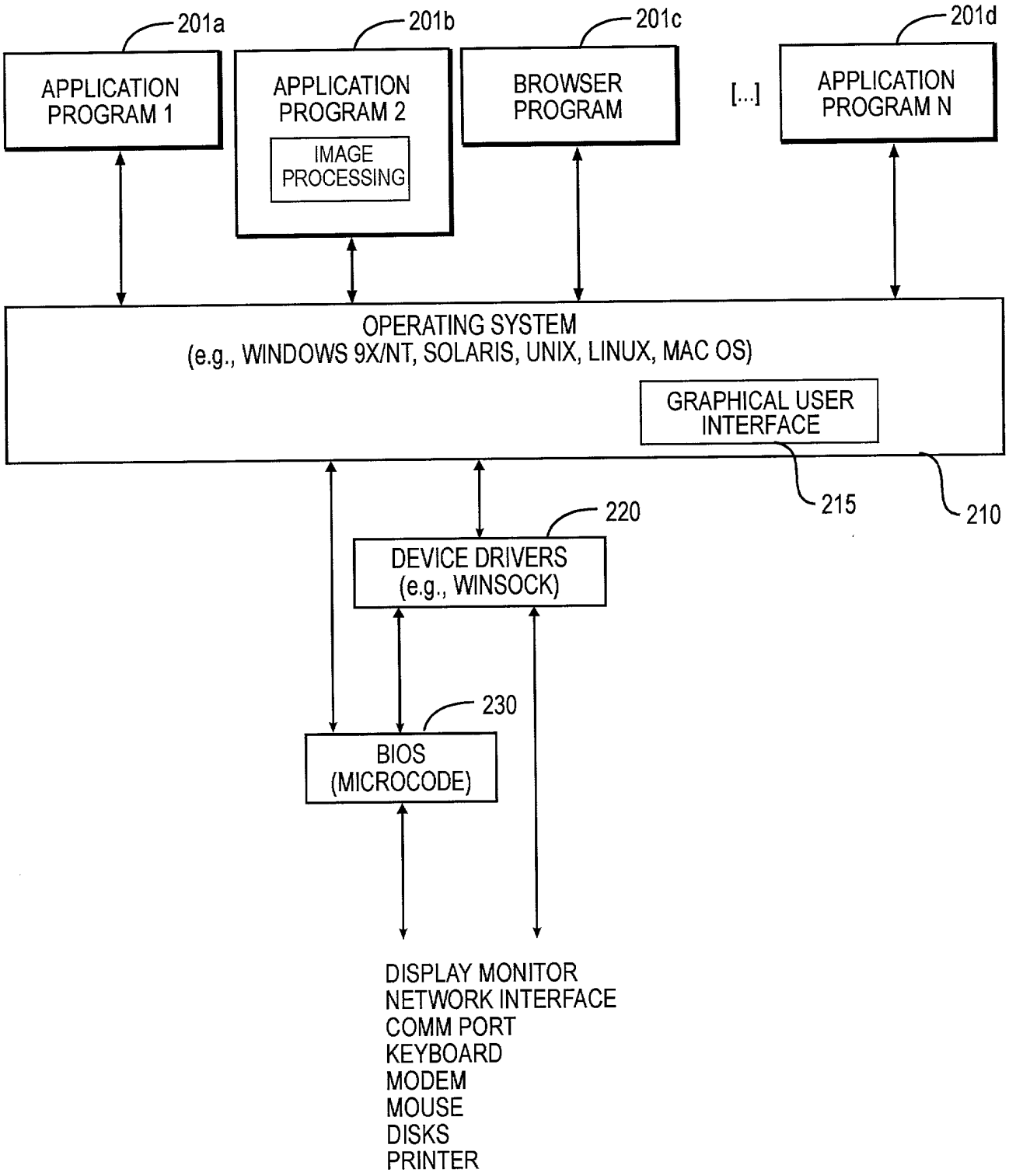

201a
APPLICATION PROGRAM 1
201b
APPLICATION PROGRAM 2
IMAGE PROCESSING
201c
BROWSER PROGRAM
[...]
201d
APPLICATION PROGRAM N
OPERATING SYSTEM
(e.g., WINDOWS 9X/NT, SOLARIS, UNIX, LINUX, MAC OS)
GRAPHICAL USER INTERFACE
215
210
220
DEVICE DRIVERS
(e.g., WINSOCK)
230
BIOS
(MICROCODE)
DISPLAY MONITOR
NETWORK INTERFACE
COMM PORT
KEYBOARD
MODEM
MOUSE
DISKS
PRINTER

FIG. 2

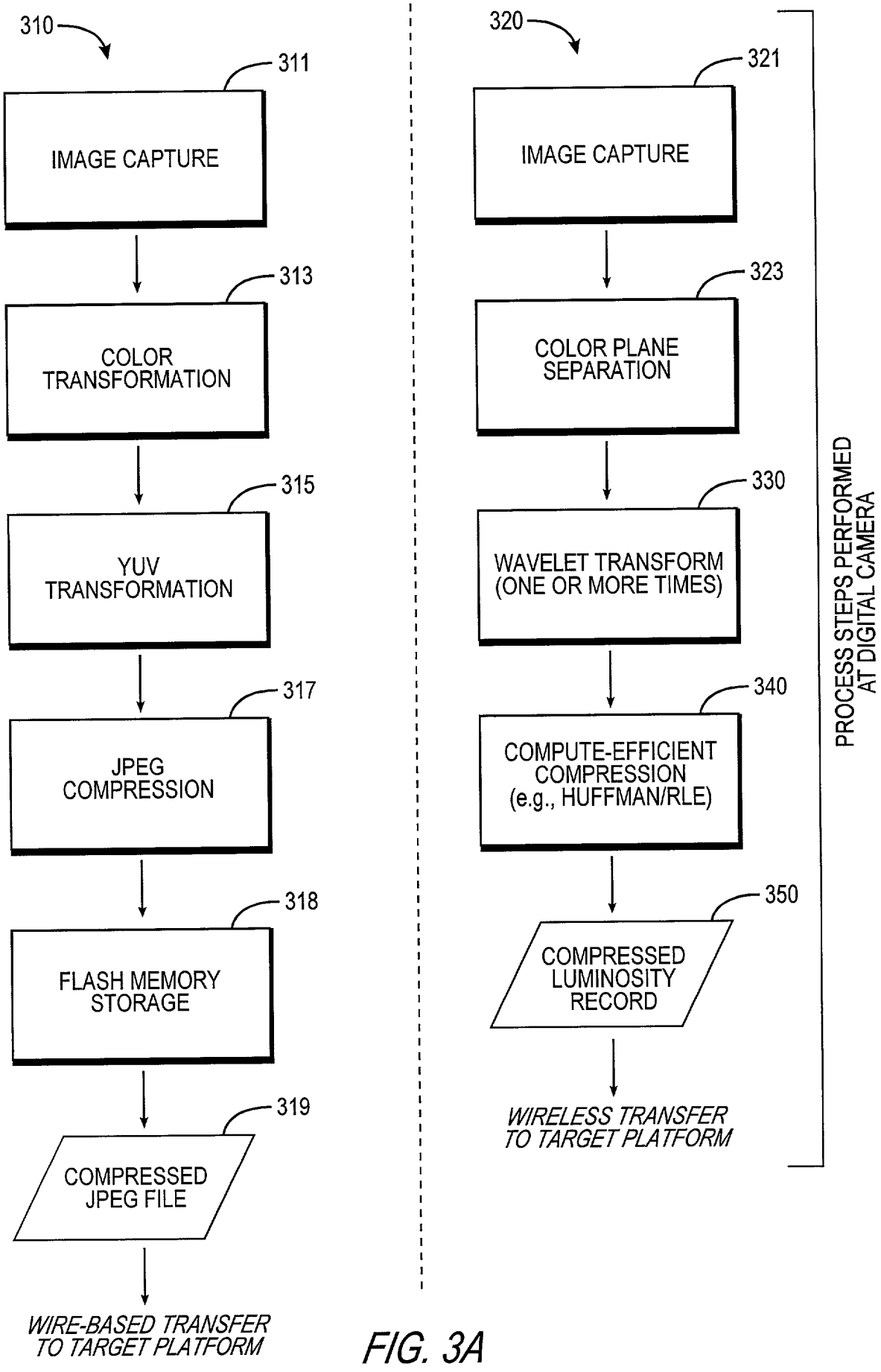

310
311
IMAGE CAPTURE
313
COLOR TRANSFORMATION
315
YUV TRANSFORMATION
317
JPEG COMPRESSION
318
FLASH MEMORY STORAGE
319
COMPRESSED JPEG FILE
WIRE-BASED TRANSFER TO TARGET PLATFORM
320
321
IMAGE CAPTURE
323
COLOR PLANE SEPARATION
330
WAVELET TRANSFORM (ONE OR MORE TIMES)
340
COMPUTE-EFFICIENT COMPRESSION (e.g., HUFFMAN/RLE)
350
COMPRESSED LUMINOSITY RECORD
WIRELESS TRANSFER TO TARGET PLATFORM
PROCESS STEPS PERFORMED AT DIGITAL CAMERA

FIG. 3A

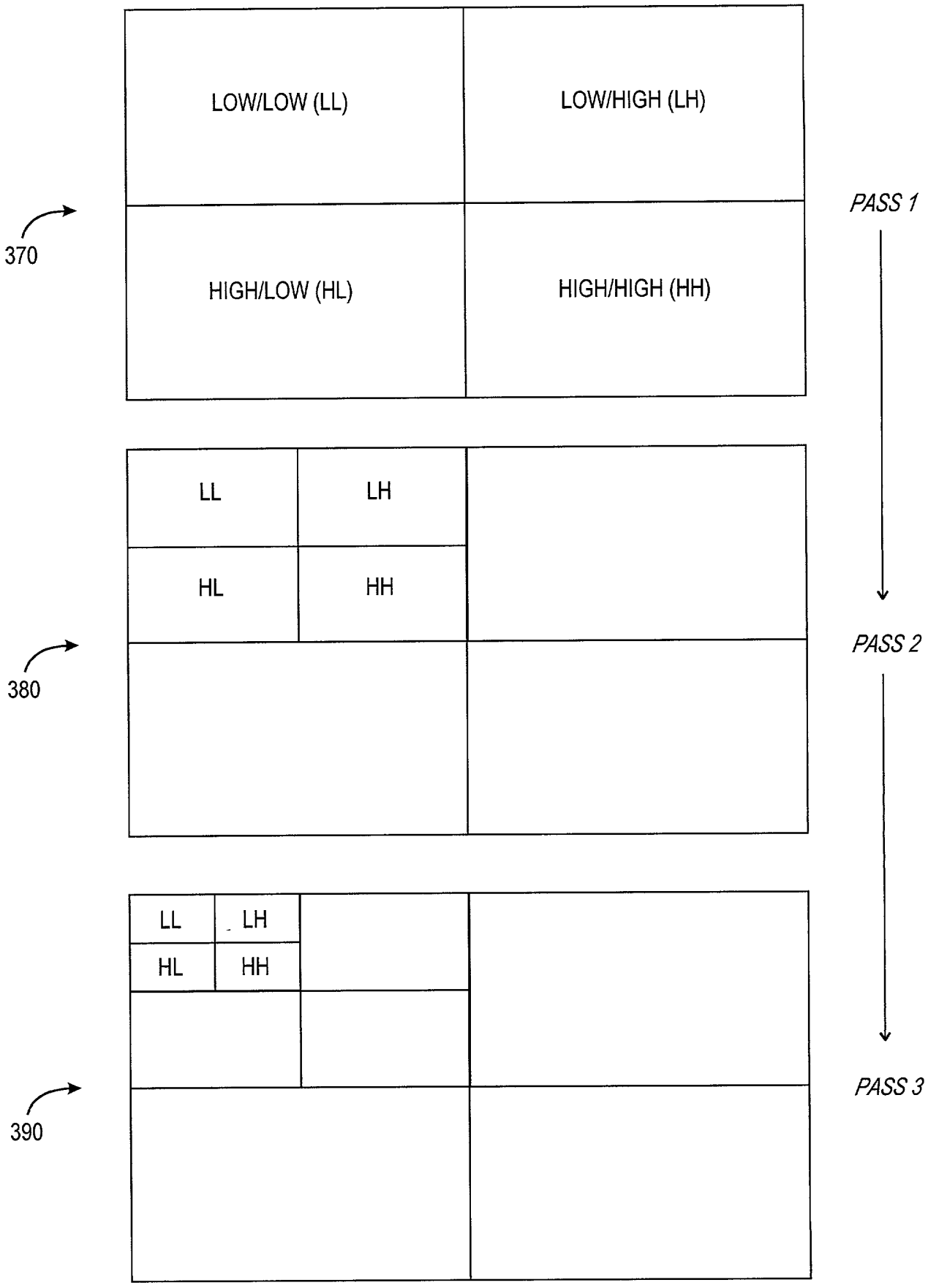


FIG. 3B

"Express Mail" EV 642 765 515

FIG. 3C

6,154,549 6,154,549

JC903 U.S. PTO
09/779769
02/07/01

JPEG COMPRESSION (48:1)

FIG. 3D

WAVELET TRANSFORM COMPRESSION (48:1)

FIG. 3E

"EXPRESS MAIL" MAILING LABEL NO. EL 642626526 US

JPEG COMPRESSION (32:1)

FIG. 3F

WAVELET TRANSFORM COMPRESSION (32:1)

FIG. 3G

Patent # 6,959,336

JPEG COMPRESSION (16:1)

FIG. 3H

WAVELET TRANSFORM COMPRESSION (16:1)

FIG. 3I

JC903 U.S. PTO
09/779769
02/07/01

Express Mail Label No. EL 656 750 545 US

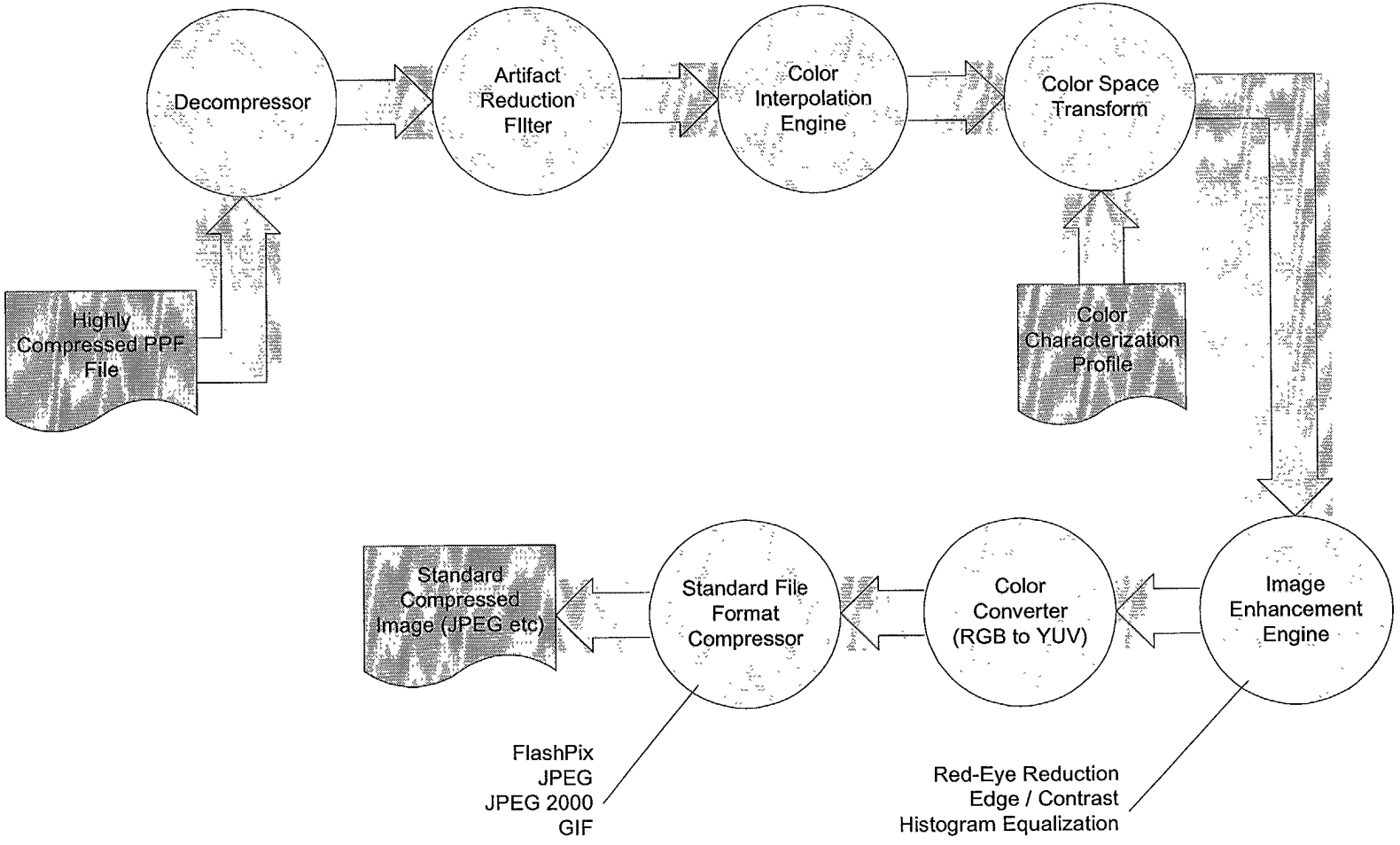

Decompressor
Artifact Reduction FIlter
Color Interpolation Engine
Color Space Transform
Highly Compressed PPF File
Color Characterization Profile
Standard Compressed Image (JPEG etc)
Standard File Format Compressor
Color Converter (RGB to YUV)
Image Enhancement Engine
FlashPix
JPEG
JPEG 2000
GIF
Red-Eye Reduction
Edge / Contrast
Histogram Equalization

FIG. 4A

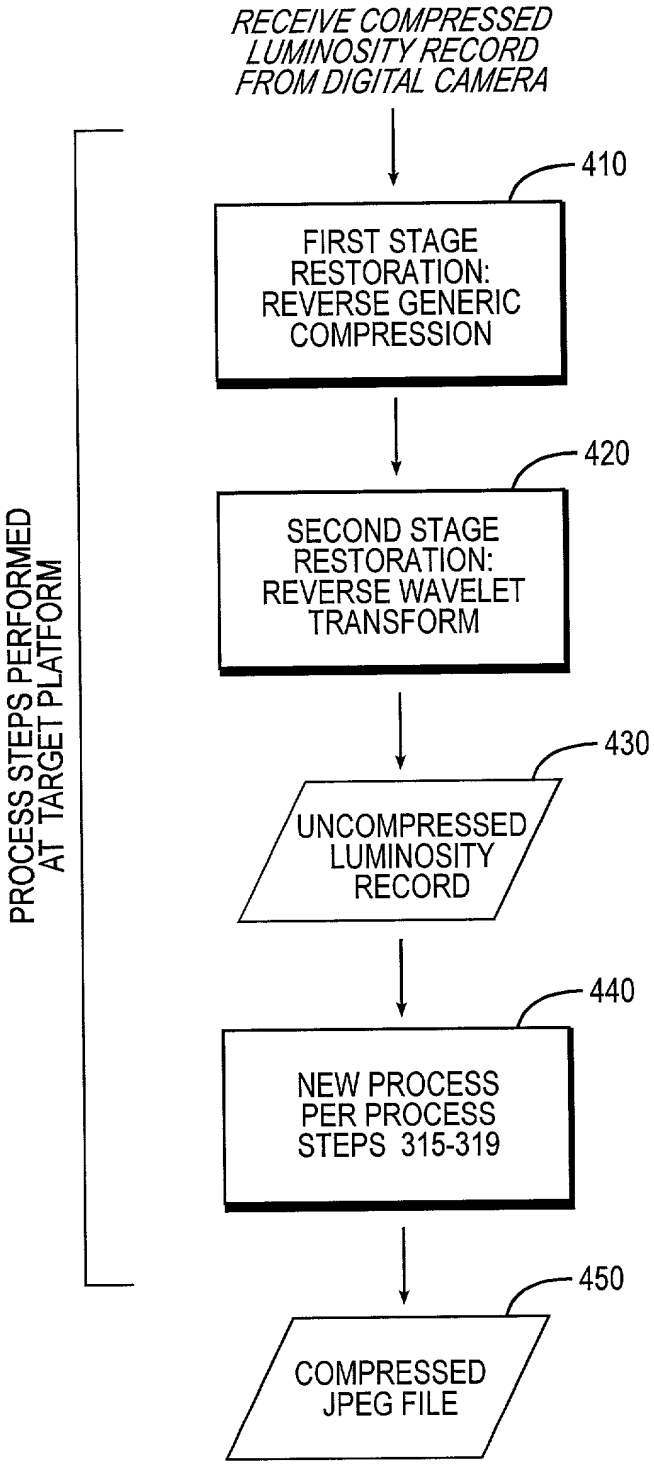

RECEIVE COMPRESSED LUMINOSITY RECORD FROM DIGITAL CAMERA
PROCESS STEPS PERFORMED AT TARGET PLATFORM
410
FIRST STAGE RESTORATION: REVERSE GENERIC COMPRESSION
420
SECOND STAGE RESTORATION: REVERSE WAVELET TRANSFORM
430
UNCOMPRESSED LUMINOSITY RECORD
440
NEW PROCESS PER PROCESS STEPS 315-319
450
COMPRESSED JPEG FILE

FIG. 4B

LIGHTSURF TECHNOLOGIES, INC.
LS/0012.00
SHEET 12 OF 21

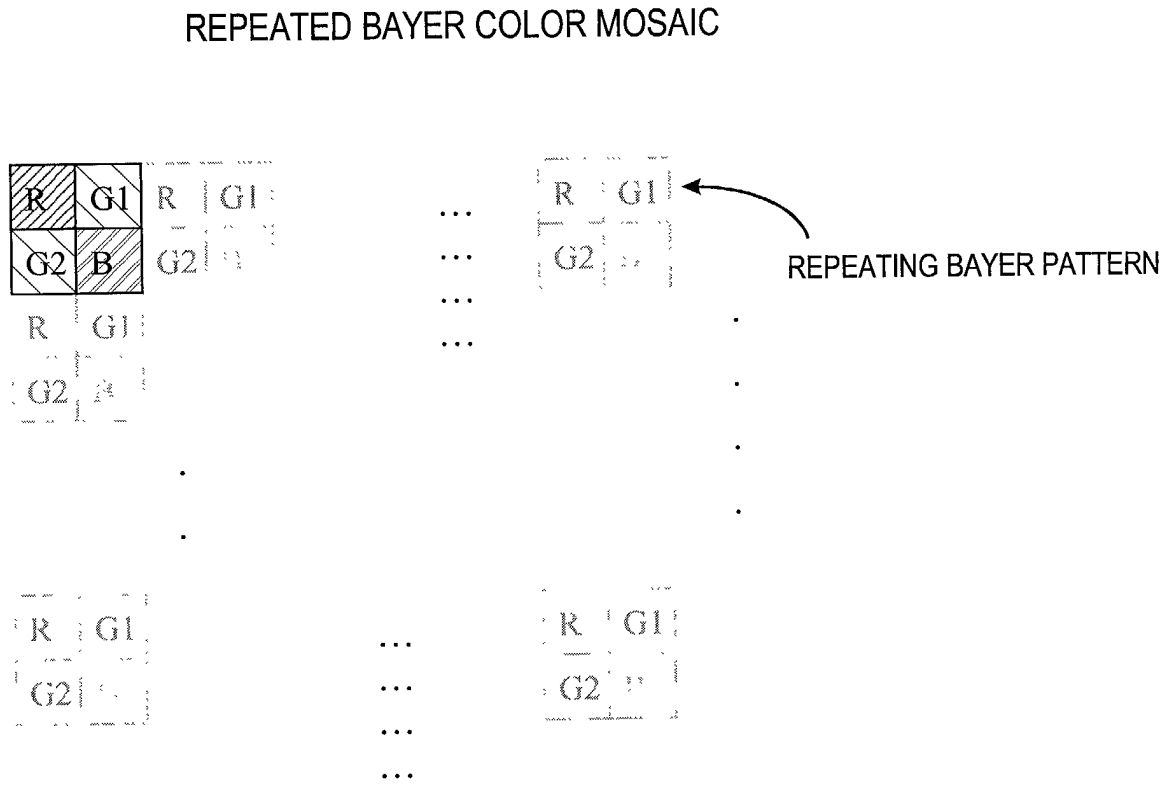


FIG. 5

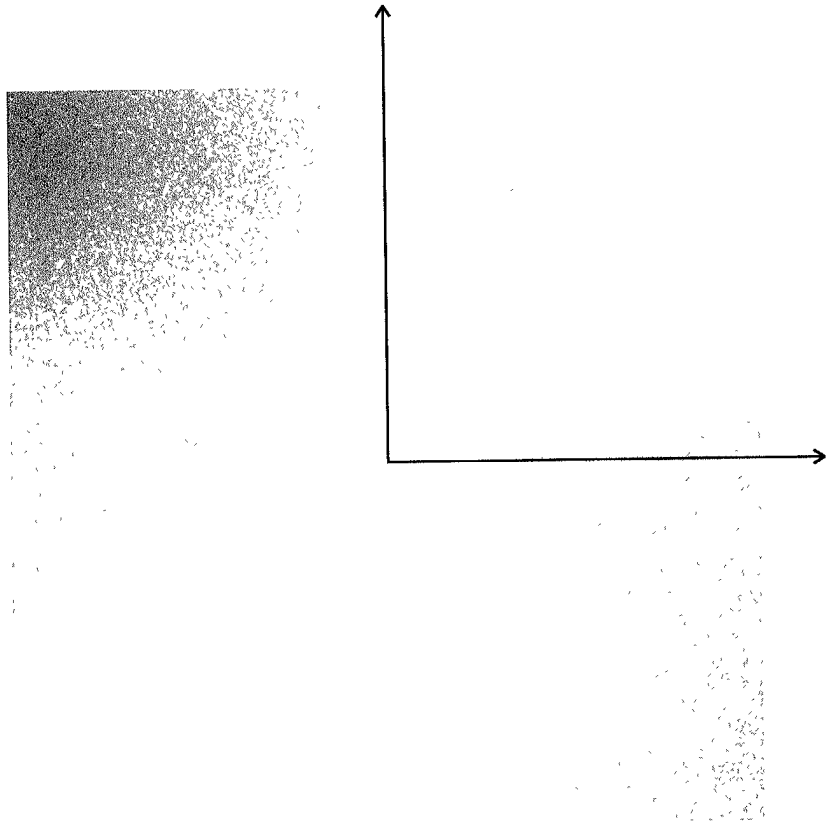


FIG. 6A

FB2020-053262268

ONE CELL OF THE BAYER PATTERN (HATCHED)
AND SOME SURROUNDING PIXELS

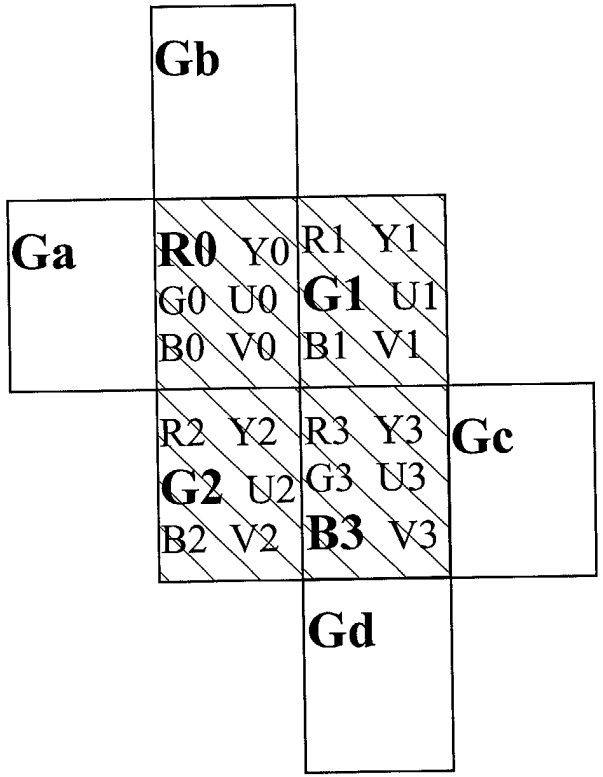


FIG. 6B

LIGHTSURF TECHNOLOGIES, INC.
LS/0012.00
SHEET 11 OF 21

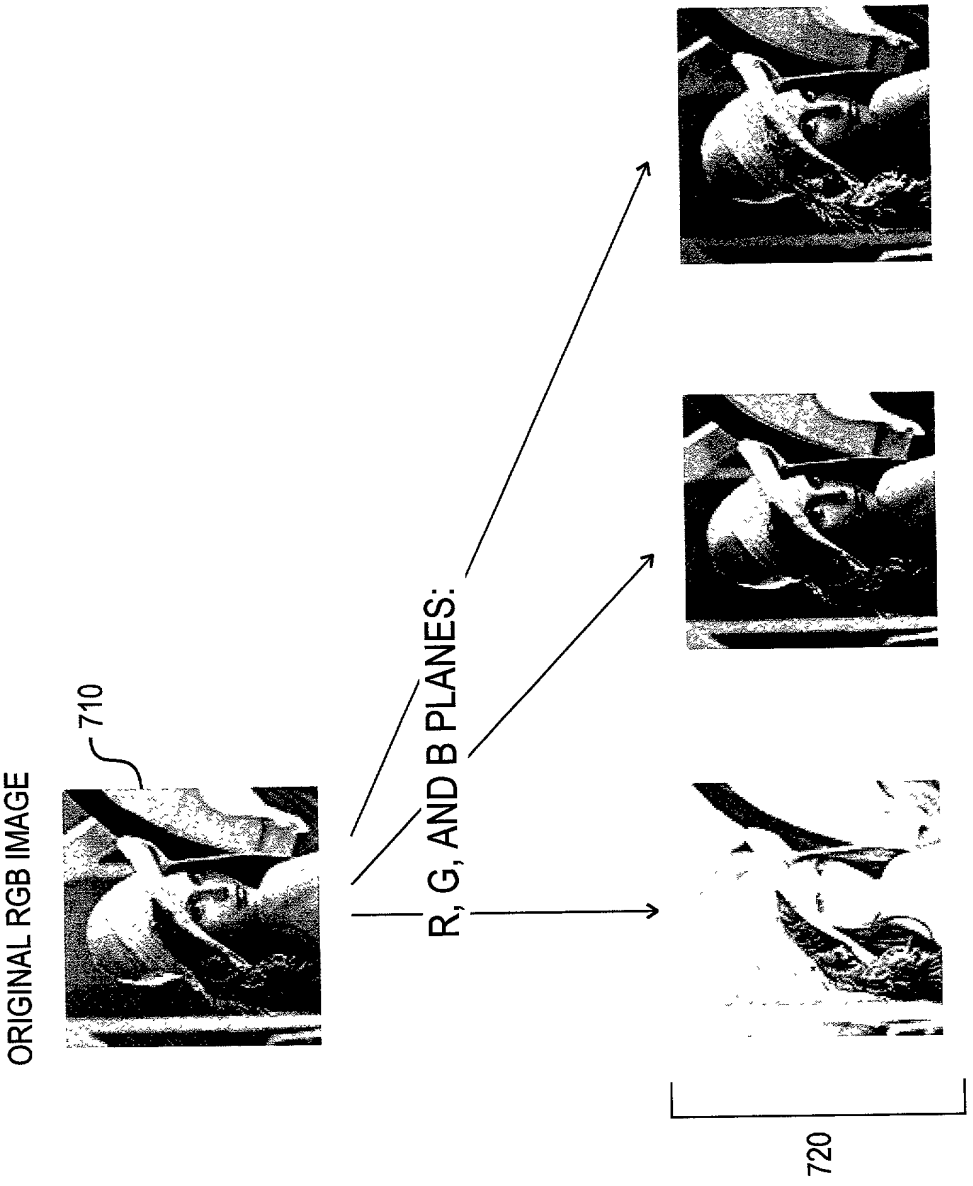


FIG. 7A

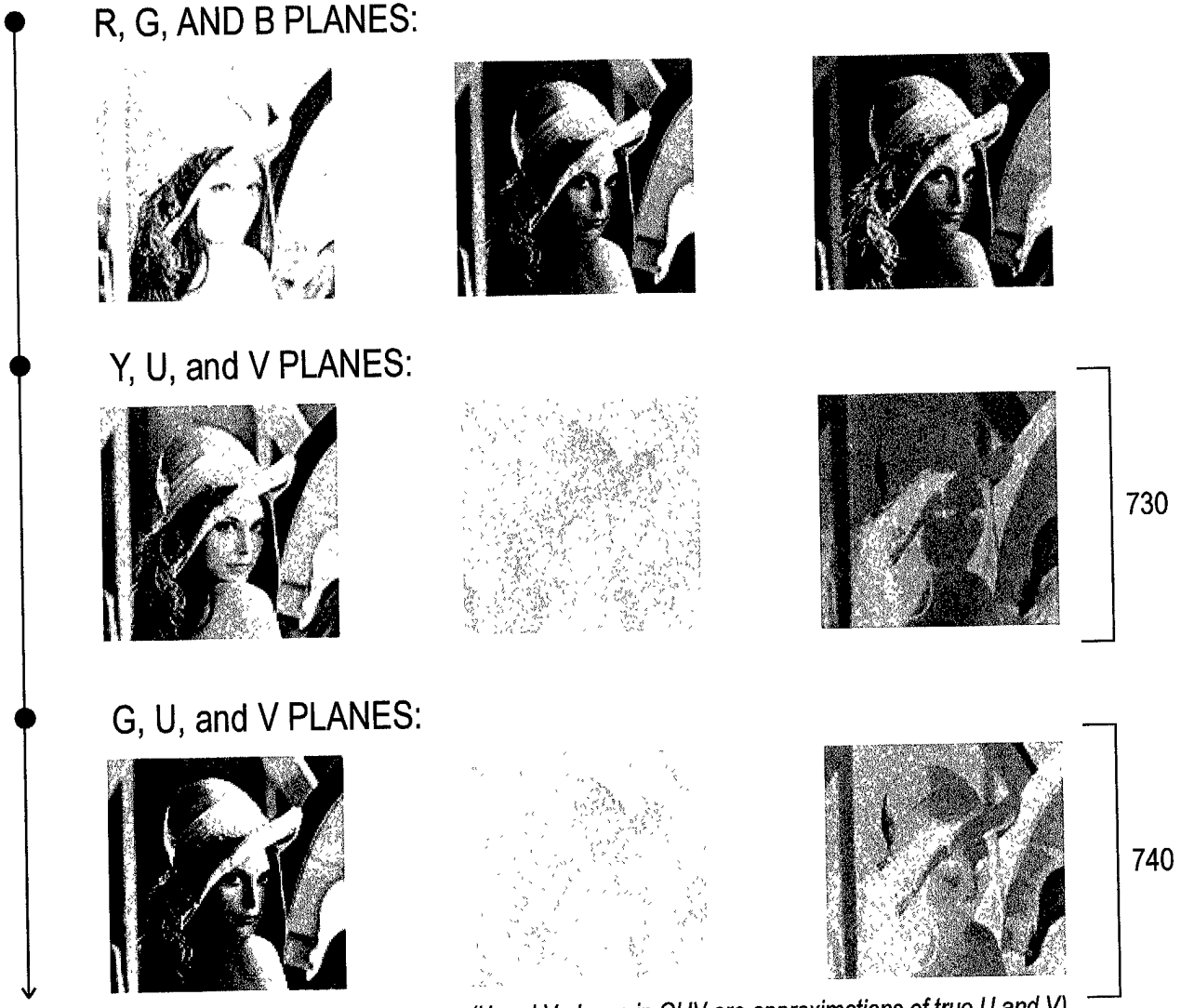
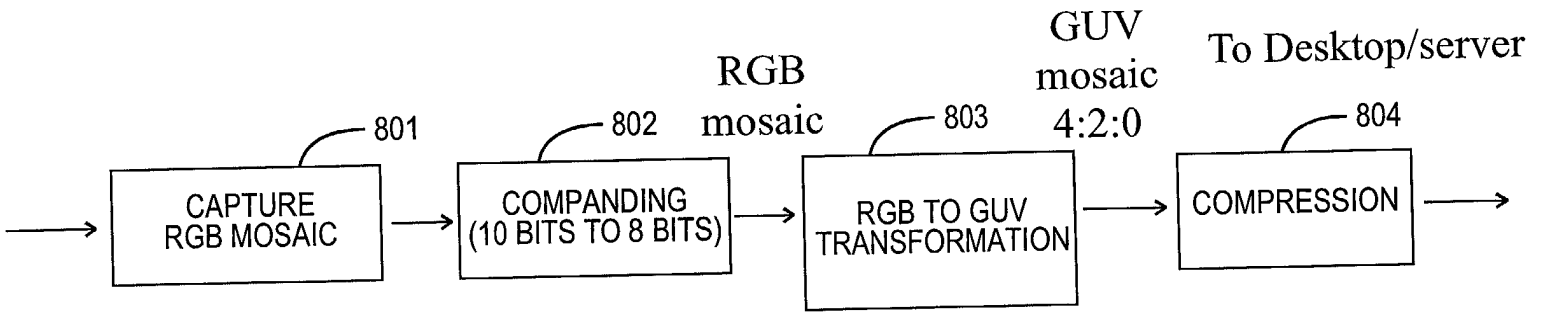
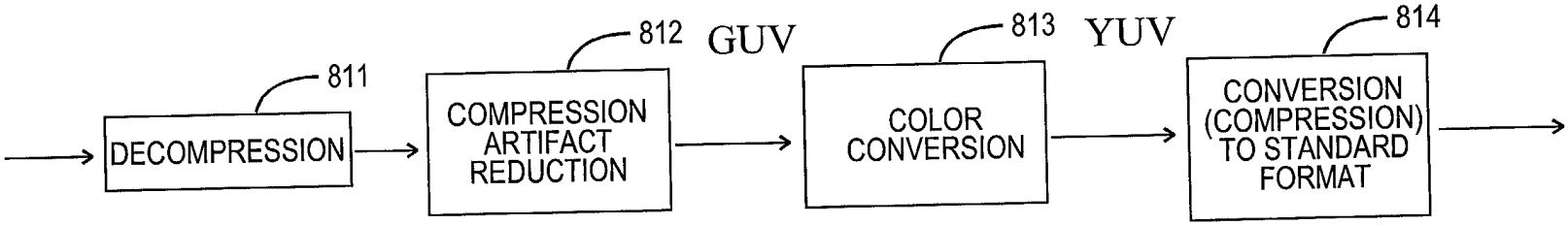

R, G, AND B PLANES:
Y, U, and V PLANES:
730
G, U, and V PLANES:
740
(U and V planes in GUV are approximations of true U and V)

FIG. 7B

PATENT



(a) Imaging Device



(b) Server/desktop

FIG. 8

LIGHTSURF TECHNOLOGIES, INC.
LS/0012.00
SHEET 17 OF 21

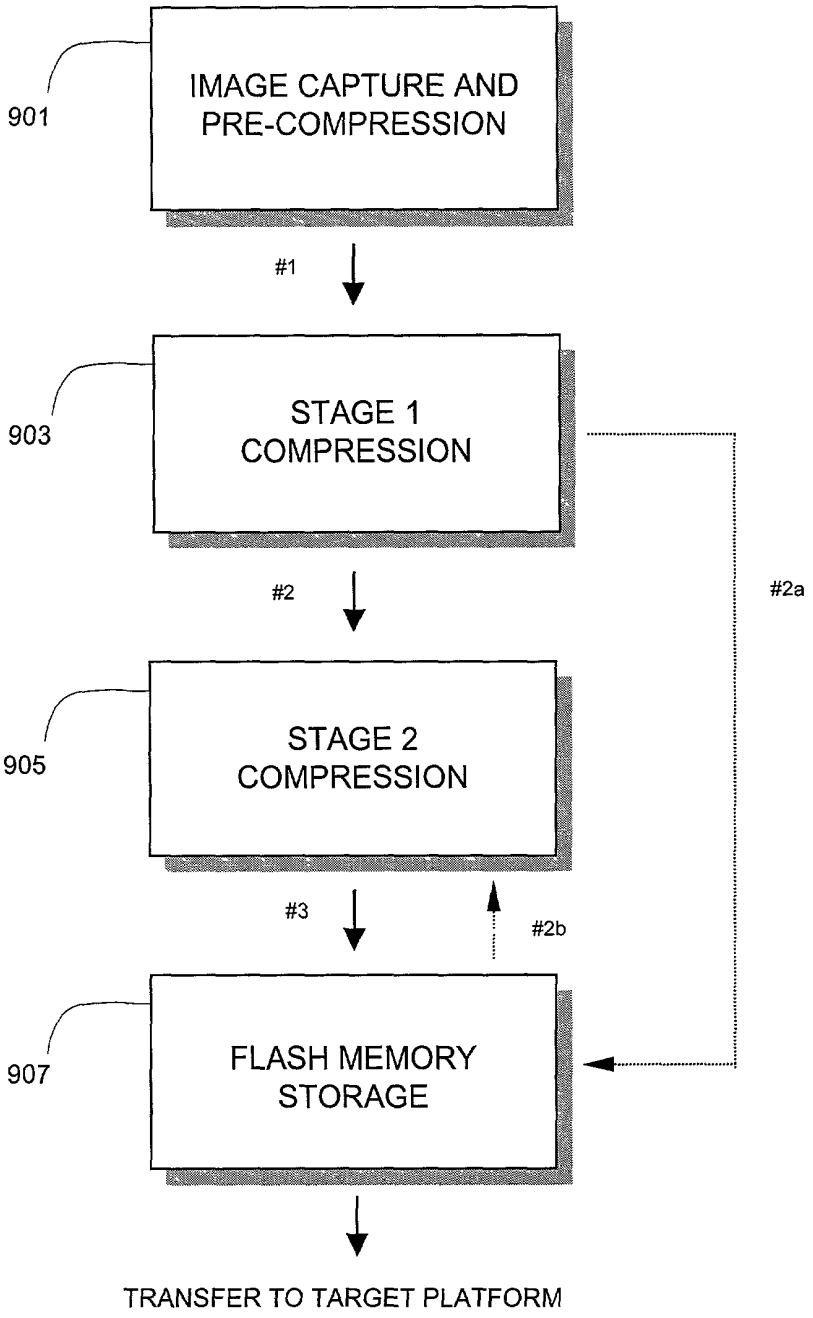

901
IMAGE CAPTURE AND PRE-COMPRESSION
#1
903
STAGE 1 COMPRESSION
#2
#2a
905
STAGE 2 COMPRESSION
#3
#2b
907
FLASH MEMORY STORAGE
TRANSFER TO TARGET PLATFORM

FIG. 9A

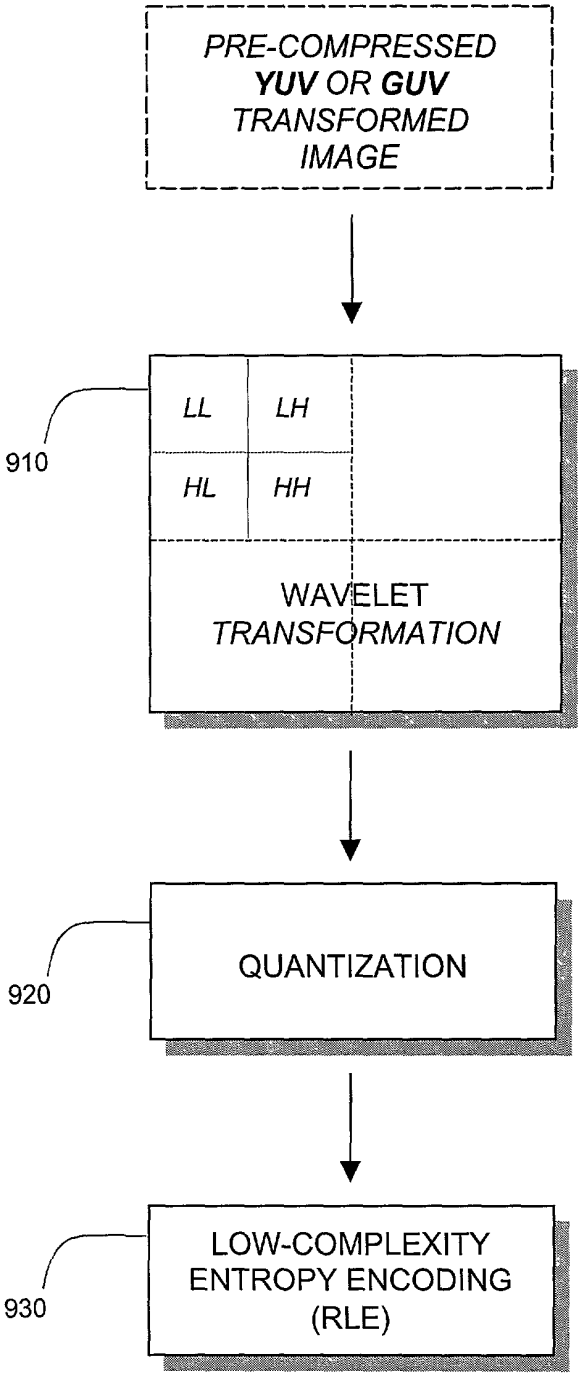

PRE-COMPRESSED
YUV OR GUV
TRANSFORMED
IMAGE
910
LL
LH
HL
HH
WAVELET
TRANSFORMATION
920
QUANTIZATION
930
LOW-COMPLEXITY
ENTROPY ENCODING
(RLE)

FIG. 9B

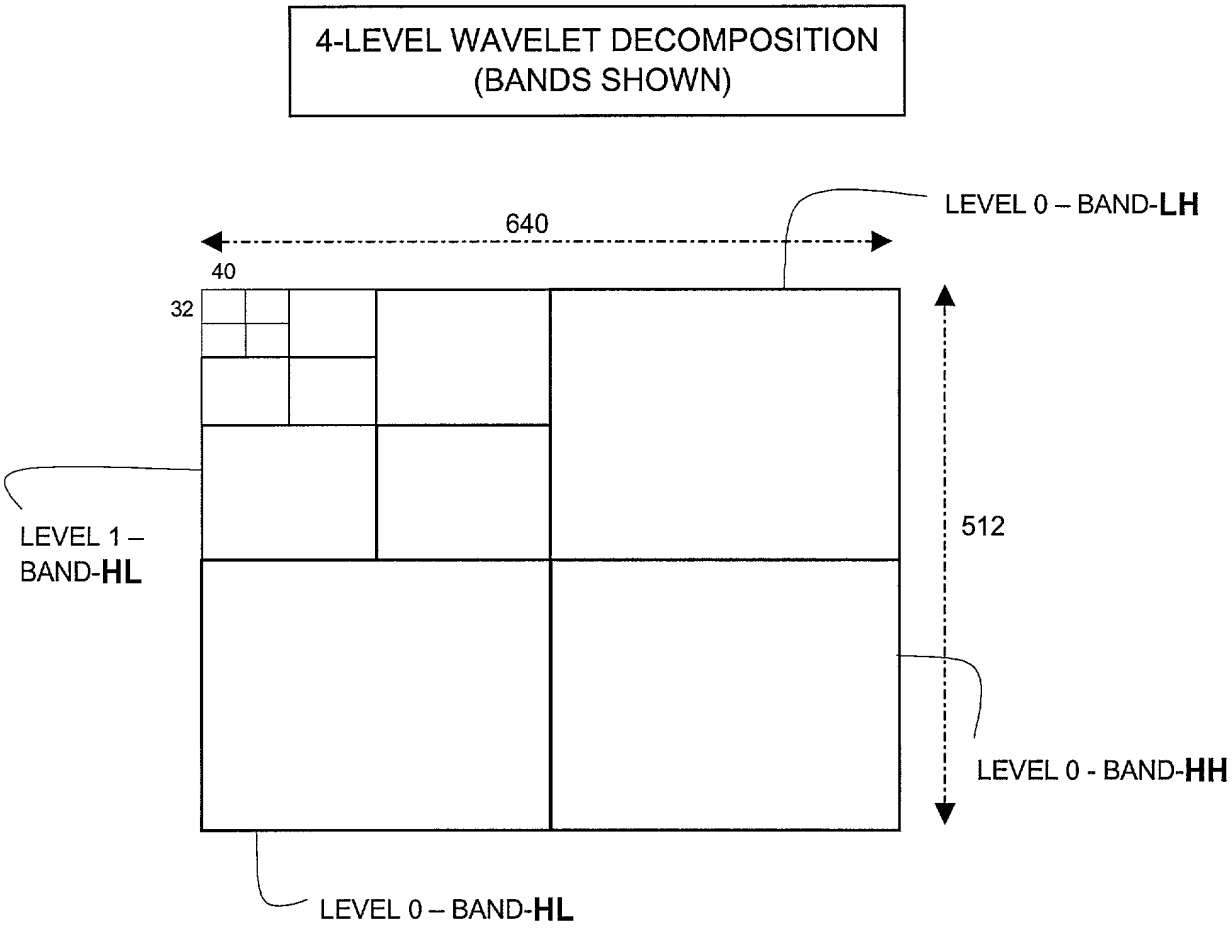


FIG. 10A

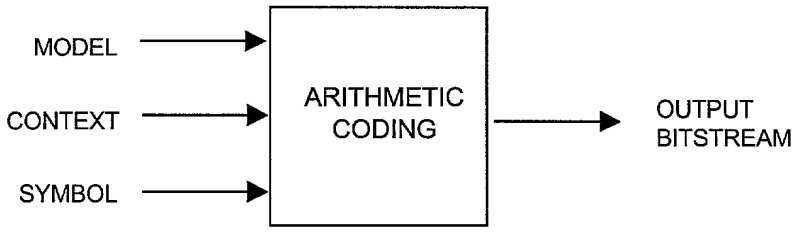


FIG. 10B

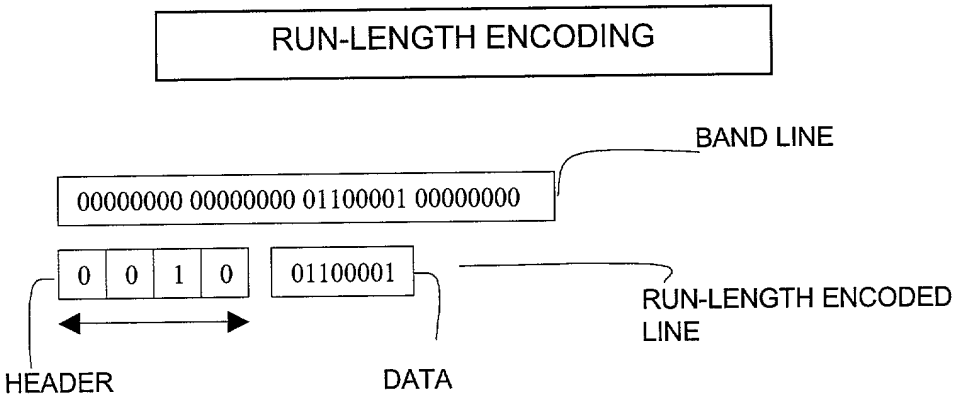


FIG. 10C

Express Mail Label No. EV339927539US